

Systematic Studies of Asian *Saussurea* (Asteraceae) II. Two New Species from Aomori Prefecture, Northern Japan

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(Received on May 2, 2008)

Two new species of *Saussurea* (Asteraceae) are described from Aomori Pref., northern Japan. *S. hosoiana* Kadota (sect. *Rosulascentes*) is described from Rokkasho-mura, Shimokita zone. *S. hosoiana* is akin to *S. diamantiaca* Nakai, however, the former differs in having a leafy, winged stem, several corymbs or spike-like racemes with short peduncles, thick, coriaceous, glossy, broadly ovate, leaf blades glabrous beneath. *S. hosoiana* grows under a sparse *Pinus densiflora* grove located near the Pacific Ocean. *S. neichiana* Kadota is described from Hachinohe, Sanpachi zone. *S. neichiana* is similar to *S. sugimurae* Honda, however, the former is distinguished from the latter by having 8-seriate, ascending at an acute angle to adpressed involucrellal phyllaries, narrowly ovate, acute outer involucrellal phyllaries, well developed, sometimes coarsely toothed stem wing and thick and coriaceous leaf blades. *S. neichiana* occurs in maritime, windy grassland facing also the Pacific Ocean. (Continued from J. Jpn. Bot. 82: 259–265, 2007)

Key words: Aomori, new species, *Saussurea hosoiana*, *Saussurea neichiana*, the Pacific Ocean.

This article is part of a revisional work of Asian *Saussurea* (Asteraceae) (Kadota 1987, 2004, 2007).

In 2006 and 2007 I had an opportunity to examine a huge collection of *Saussurea* (Asteraceae) from Aomori Prefecture, northern Honshu, Japan. These specimens were kindly sent to me by Messrs. K. Hosoi, M. Neichi, Y. Shima, Y. Kudo and I. Sato. The collection was mostly composed of two *Saussurea* species; *S. muramatsui* Kitam. and *S. sugimurae* Honda. However, a few specimens from the Monomi-zaki Cape facing the Pacific Ocean, Rokkasho-mura, Shimokita-gun, Aomori Pref., are equivalent to neither *S. muramatsui* nor *S. sugimurae*. It was consequently necessary to make field examinations in order to clarify the identity

of the plants from the Monomi-zaki Cape.

In September of 2007 I conducted a field research around the Monomi-zaki Cape under the guidance of Mr. K. Hosoi and Ms. M. Jin. The plants in question were found under a sparse *Pinus densiflora* grove. To my great surprise the plants bore persistent radical leaves during the flowering time (Fig. 1, the largest leaf on the left hand; Fig. 2). The plant is additionally characterized by having a firm body and thick, coriaceous, glossy leaf blades. The nature of the leaves recall those of *S. chionophylla* Takeda, an endemic of ultrabasic rock areas of Mt. Yûbari-dake and Mt. Chiroro-dake, Hokkaido, Japan. *Saussurea chionophylla* has glabrous receptacles, however, the receptacles of the Monomi-zaki Cape plants are



Fig. 1. Holotype of *Saussurea hosoiana* Kadota (JAPAN: Honshu, Aomori Pref., Kamikita-gun, Rokkasho-mura, Tomari, the Monomi-zaki Cape, alt. 20 m, 6 September 2007, Y. Kadota 074314, TNS 770861).

setaceous. In the genus *Saussurea* subgenus *Saussurea* the presence of radical leaves at anthesis and setae indicates that this plant belongs to sect. *Rosulascentes* (Kitam.) Lipsch. (Nakai 1909, 1915, Kitamura 1935, 1937, Lipschitz 1979, Shih and Jing 1999) and that this plant has no relationships with either *S. muramatsui* or *S. sugimurae* (sect *Saussurea* ser. *Tohiren*). The plant therefore belongs to an undescribed species within sect. *Rosulascentes*. Here I describe the species as *S. hosoiana* after Mr. K. Hosoi, who gave me an opportunity to study the species in detail.

In the course of the field examination in 2007 peculiar plants were found at Kofunato, Hachinohe-shi. As a consequence of later analysis it is confirmed that the plants from Hachinohe belong to another undescribed species. I describe this species *S. neichiana* after Mr. M. Neichi, who has contributed to the understanding of the flora of Aomori Prefecture, northern Japan.

Taxonomic treatment

***Saussurea* DC.** in Ann. Mus. Natl. Hist. Nat. Paris **16**: 156, 198 (1810); Prodr. **VI**: 531 (1837).

Subgen. ***Saussurea***: Lipsch., Fl. URSS **27**: 392 (1962); Gen. *Saussurea* 95 (1979) – H. Koyama in K. Iwats. & al., Fl. Jap. **IIIa**: 153 (1885) – C. Shih & S.-Y. Jing in Y.-L. Chen & C. Shih, Fl. Reipub. Popul. Sin. **78** (2): 66 (1999).

Sect. ***Rosulascentes*** (Kitam.) Lipsch., Gen. *Saussurea* 171 (1979), p.p. – C. Shih & S.-Y. Jing in Y.-L. Chen & C. Shih, Fl. Reipub. Popul. Sin. **78**(2): 154 (1999), p.p. – sect. *Saussurea* subsect. *Rosulascentes* Kitam. in Acta Phytotax. Geobot. **24**: 22 (1969).

Sect. *Caulescentes* auct. non Hook. f.: Kitam. in Acta Phytotax. Geobot. **5**: 11 (1935).

***Saussurea hosoiana* Kadota, sp. nov.**

[Figs. 1, 2]

Differt a *Saussurea diamantiaca* caule foliaceo alato ramoso, folio radicali crasso coriaceo nitido late ovato subter glabro, phyllariis exterioribus involucrium anguste ovatis, pedunculis brevioribus (0–)1–3 mm longis, capitibus pluribus.

TYPE: JAPAN: Honshu, Aomori Pref., Kamikita-gun, Rokkasho-mura, Tomari, the Monomi-zaki Cape, alt. 20 m, 6 September 2007, Y. Kadota 074314 (TNS 770861–holotype, Figs. 1, 2), Kadota 074311–074313 (TNS 770859–770860, 770862–isotype).

A medium-sized, firm, herbaceous perennial, 30–40 cm tall. Rhizome oblique to erect, ca. 1.5 cm in diameter, with string-like roots. Stem erect, leafy, striate, winged, sparingly sparingly pubescent with short, brownish, multicellular hairs in the upper part, 3–7 times branched; wings up to 4 mm wide. Basal leaves persistent at anthesis. Basal and lower cauline leaves thick, coriaceous, glossy, broadly ovate, 11–18 cm long, 10–16 cm wide, shallowly dentate, sparingly pubescent with short, brownish, multicellular hairs on the adaxial side, similarly pubescent along veins on the abaxial side, deeply cordate at base, obtuse with acute tip at apex; petioles 9–14 cm long, sparingly pubescent with short, brownish, multicellular hairs, winged. Middle and upper cauline leaves elliptic to ovate, 4–5 cm long, 1.5–4 cm wide, shallowly serrate, truncate to cuneate at base, acuminate at apex, similarly pubescent to the lower cauline leaves, shortly petiolate, amplexicaul; petioles winged. Flowers in August to September, with 2–5 capitula, arranged in a compact corymb or a spike-like raceme; peduncles (0–)1–3 mm long, divaricate, sparingly arachnoid. Involucres campanulate to cylindrical, 10–18 mm in diameter, 13–16 mm long, arachnoid; phyllaries 8-seriate; outer phyllaries ovate, 4–6 mm long,

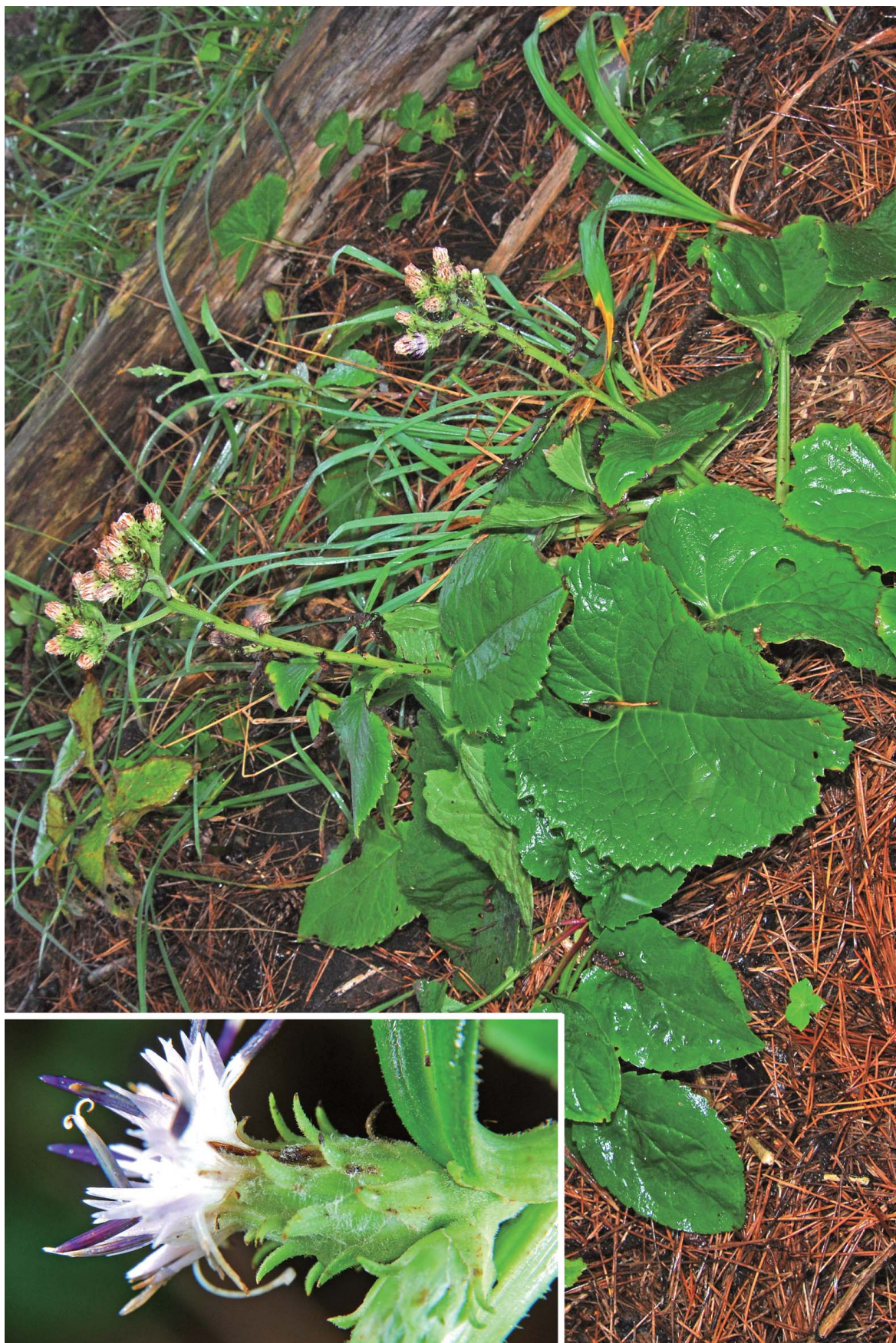


Fig. 2. Habit and involucre of *Saussurea hosoiiana* Kadota (JAPAN: Honshu, Aomori Pref., Kamikita-gun, Rokkasho-mura, Tomari, the Monomi-zaki Cape, 6 September 2007, the same individual of the holotype specimen).

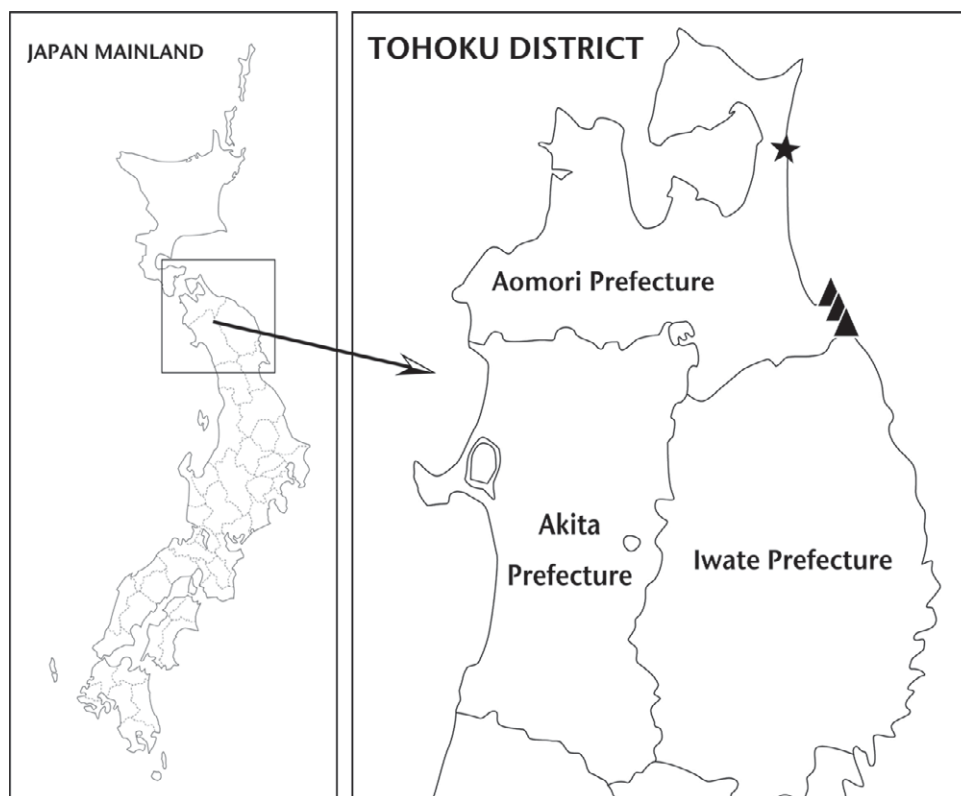


Fig. 3. Distribution of *Saussurea hosoiana* Kadota (★) and *S. neichiana* Kadota (▲).

acuminate, recurved; inner phyllaries lanceolate, 10–13 mm long, acute; setae 6 mm long; subtending leaves 3–4, lanceolotriangular, 5–15 mm. Corollae purplish violet, 12–13 mm long; lobes 3–4 mm long; throats 2.5–3 mm long; tubes 6 mm long; anthers 6 mm long, deep bluish purplish. Pappi 2-whorled, grayish white; outer 3 mm long, simple; inner 9–10 mm long, plumose. Achenes 6 mm long, glabrous, straw-colored, light brownish purple-lined and/or -spotted, striate.

Japanese name: Mutsu-tôhiren (nov.).

新和名：ムツトウヒレン

Distribution: the Monomi-zaki Cape, Rokkasho-mura, Aomori Pref., Honshu, Japan (Fig. 3, star). Endemic to Japan.

Additional specimens examined: JAPAN: Aomori Pref., Shimokita-gun, Rokkasho-mura, the Monomi-zaki Cape, 10 Aug. 1981, M. Kakuda s.n. (Herb. Aomori Pref. Mus.); the Monomi-zaki Cape, in *Pinus thunbergii* wood, alt. 25 m, 10 Sept. 2008, Y. Kadota

085023–085026 (TNS); Higashidôri-mura, the Monomi-zaki Cape, 19 Aug. 1989, K. Hosoi s.n. (Herb. Aomori Pref. Mus.).

As above-mentioned *S. hosoiana* belongs to sect. *Rosulascentes* (Kitam.) Lipsch. Among the constituent species of this section *S. diamantiaca* is closer to *S. hosoiana* than other species. *Saussurea hosoiana* is different from *S. diamantiaca* in habit (leafy vs. scapose to subscapose), texture, shape and pubescence of radical leaf blade (thick, coriaceous, glossy, broadly ovate and glabrous beneath vs. thin, chartaceous, non-glossy, ovate to narrowly ovate and densely arachnoid beneath) and the number of heads (several vs. 2–3 or solitary) (Nakai 1909, 1915, Kitamura 1937, W. T. Lee 1996a, 1996b, Y. N. Lee 1996, Lipschitz 1979).

The scapose to subscapose habit is characteristic of sect. *Rosulascentes*: *S. conandrifolia* Nakai, *S. eriophylla* Nakai, *S. rectinervis* Nakai, *S. rorinsanensis* Nakai,

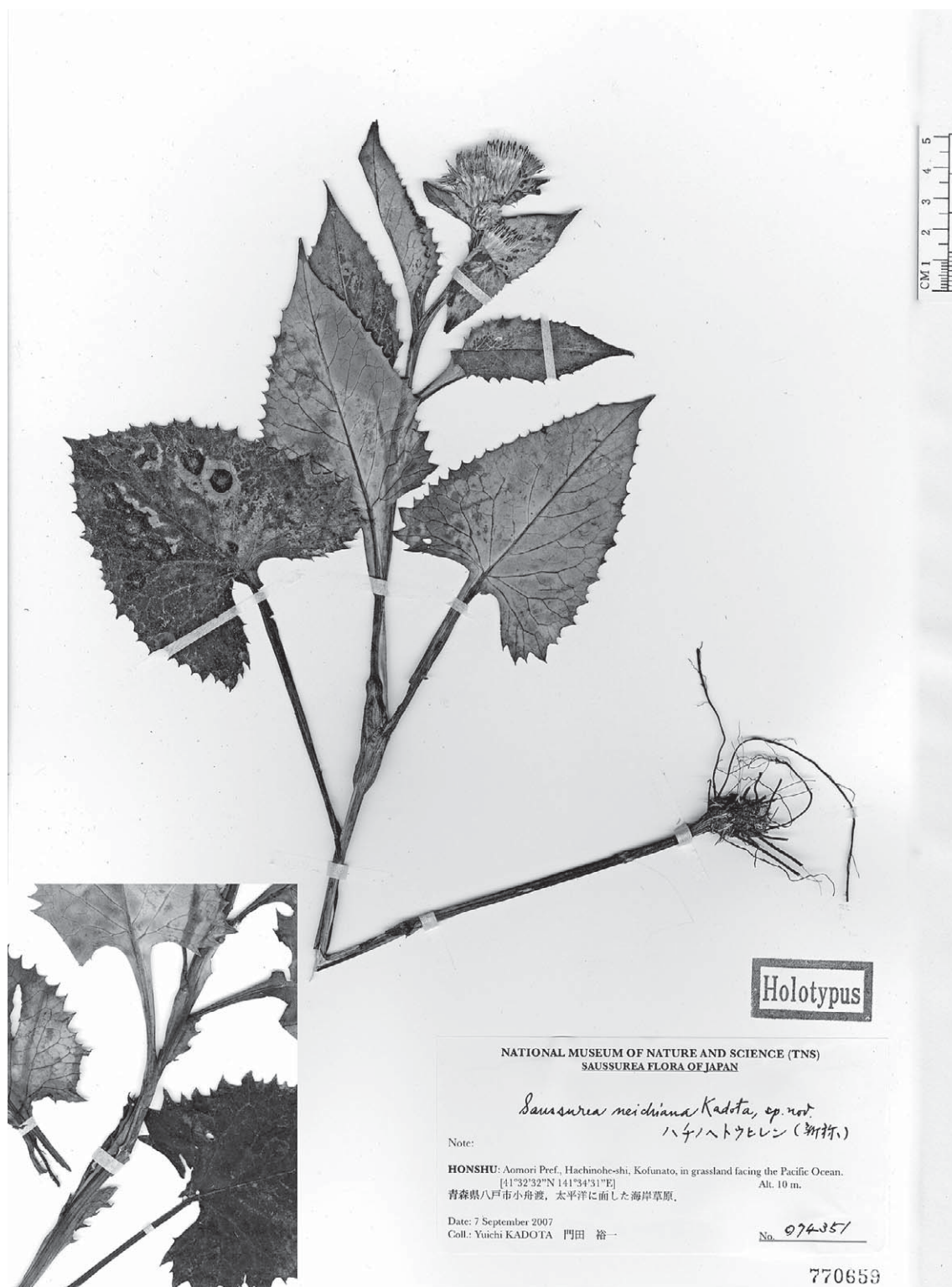


Fig. 4. Holotype of *Saussurea neichiana* Kadota (JAPAN: Honshu, Aomori Pref., Hachinohe-shi, Kofunato, alt. 10 m, 7 September 2007, Y. Kadota 074351, TNS 770659). Left corner inset shows serrate wing of stem.

S. seoulensis Nakai, *S. tomentosa* Kom. [= *S. alpicola* Kitam.] and *S. uchiyamae* Nakai. *Saussurea hosoiana*, however, does not have the scapose habit. The assignment of *S. hosoiana* to sect. *Rosulascentes* is therefore still questionable.

Saussurea hosoiana occurs under a sparse *Pinus densiflora* grove established on a bluff facing the Pacific Ocean. This pine grove was ca. 5 m in height and was devoid of shrub layer. For this reason the habitat of *S. hosoiana* may be greatly affected by strong wind from the sea. The environmental condition of this habitat may be equivalent to that of maritime grassland. The hardy plant body of this species (particularly stem and leaves) is considered to be a result of adaptation to this severe environmental condition. On the contrary the continental species of sect. *Rosulascentes* occur in the mountains at the elevation of higher than 1000 m and bear chartaceous leaves similarly to *S. muramatsui* and *S. sugimurae*.

Sect. **Saussurea**: Lipsch., Gen. *Saussurea* 178 (1979), p. p.–H. Koyama in K. Iwats. & al., Fl. Jap. **IIIa**: 153 (1885), p.p. – C. Shih & S.-Y. Jing in Y.-L. Chen & C. Shih, Fl. Reipub. Popul. Sin. **78**(2): 158 (1999), p.p.

Sect. *Lagurostemon* (Cass.) DC., Prodr. **VI**: 532 (1837).

Ser. **Tohiren** Kitam. in Acta Phytotax. Geobot. **4**: 8 (1935), p.p.; in Mem. Coll. Sci., Kyoto Imp. Univ., ser. B, **13**: (Compos. Jap. I) 181 (1937), p.p.

Ser. *Imbricatae* Kitam. in Acta Phytotax. Geobot. **4**: 11 (1935), p.p.; in Mem. Coll. Sci., Kyoto Imp. Univ., ser. B, **13**: (Compos. Jap. I) 198 (1937), p.p. minore.

Subsect. *Cordifolia* Lipsch., Gen. *Saussurea*: 180 (1979), p.p.

Saussurea neichiana Kadota, sp. nov.

[Figs. 4, 5]

Differt a *Saussurea sugimurae* phyllariis 8-seriatis, phyllariis exterioribus involucrorum brevioribus acutis anguste ovatis, alis

latioribus grosse serratis, foliis crassioribus.

TYPE: JAPAN: Honshu, Aomori Pref., Hachinohe-shi, Kofunato, alt. 10 m, 7 September 2007, Y. Kadota 074351 (TNS 770659–holotype, Fig. 4), Kadota 074352–074354 (TNS 770660–770662–isotype).

A medium-sized, herbaceous perennial, 40–80 cm tall. Rhizome oblique, ca. 1.0 cm in diameter, with string-like roots. Stem erect, striate, strongly winged, sparingly arachnoid in the upper part, 1–6 times branched; wings up to 8 mm wide, occasionally serrate. Basal leaves withering at anthesis. Lower cauline leaves coriaceous, narrowly ovate to ovate, 9–12 cm long, 7–9 cm wide, coarsely dentate, sparingly pubescent with short, brownish, multicellular hairs on the adaxial side, glabrous on the abaxial side, cordate at base, acute at apex; petioles 7–11 cm long, sparingly pubescent with short, brownish, multicellular hairs. Middle and upper cauline leaves narrowly ovate, 2.5–8 cm long, 1–5 cm wide, serrate, truncate to cuneate at base, acuminate at apex, similarly pubescent to the lower cauline leaves, shortly petiolate, amplexicaul; petioles broadly winged. Flowers in September, with 2–5 capitula, arranged in a compact corymb; peduncles 0.5–2 cm long in the terminal corymb, ascending at an acute-angle, sparingly arachnoid. Involucres campanulate, 12–18 mm in diameter, 15–17 mm long, arachnoid; phyllaries 8-seriate; outer phyllaries narrowly ovate, 5–12 mm long, acuminate; inner phyllaries narrowly elliptic, 14–17 mm long, acute; setae 6 mm long; subtending leaves 3–4, narrowly ovato-lanceolate, 1–1.5 cm. Corollae purplish violet, 12–13 mm long; lobes 5 mm long; throats 2 mm long; tubes 6–7 mm long; anthers 6 mm long, deep bluish purplish. Pappi 2-whorled, grayish white; outer 3–5 mm long; inner 9–11 mm long. Achenes ca. 6 mm long, glabrous, straw-colored, purple-lined and purple-spotted, striate.



Fig. 5. Habit and involucre of *Saussurea neichiana* Kadota. Left. JAPAN: Honshu, Aomori Pref., Hachinohe-shi, Kofunato-taira, on 19 Aug. 2000 (courtesy of Mr. M. Neichi). Right. Hachinohe-shi, Kofunato, on 7 Sept. 2007.

Japanese name: Hachinohe-tôhiren (nov.).

新和名：ハチノヘトウヒレン

Distribution: Kofunato, Hachinohe-shi, Aomori Pref., Honshu, Japan (Fig. 3, triangle). Endemic to Japan.

Additional specimens examined: JAPAN: Aomori Pref., Hachinohe-shi, Same-machi, Akakô, *alias* Tanesashi Kaigan, 16 May 2008, with the former year's scapes, M. Neichi s.n. (TNS 772782–772783); Hachinohe-shi, Same-machi, Ôkuki, 16 May 2008, with the former year's scapes, M. Neichi s.n. (TNS 772784); Hachinohe-shi, Kanehama, 16 May 2008, with the former year's scapes, M. Neichi s.n. (TNS 772785).

Saussurea neichiana is discriminated from *S. sugimurae* by having 1) 8-seriate involucre phyllaries (Fig. 4), 2) shorter, acute, narrowly ovate outer involucre phyllaries (Fig. 5), 3) thicker, coriaceous leaves, and 4) wider, sometimes coarsely serrate stem wing.

Saussurea sugimurae has been considered to have 8-seriate involucre phyllaries (e.g., Kitamura 1937, 1981). However, based on the re-examination of the type specimen, it is confirmed that *S. sugimurae* has 6-seriate involucre phyllaries.

Saussurea neichiana is different from *S. sugimurae* in having narrowly ovate leaf blades. However, populations of *S. sugimurae* from Aomori Prefecture tend to have narrowly ovate leaf blades. Accordingly *S. neichiana* is not distinguished from *S. sugimurae* in the shape of leaf blades.

Saussurea neichiana was found growing exclusively in grasslands facing the Pacific Ocean. On the contrary *S. sugimurae* grows under summer-green woods in the mountains of the inland regions, Aomori and Iwate Prefectures, northern Honshu, Japan.

Saussurea muramatsui and *S. sugimurae* have been frequently confused or placed in the same taxon (e.g., Ohwi 1953, 1972, Ono et al. 1989, Ohwi (Kitagawa) 1992, Koyama 1995, Yonekura and Kajita 2003–2008). However, *S. muramatsui* is distinguished

from *S. sugimurae* by the pubescence of involucres (densely arachnoid vs. scarcely arachnoid), the direction of involucre phyllaries (patent vs. ascending) and the shape of leaf blades (ovate vs. saggitate). *Saussurea muramatsui* is distributed in Yamagata, Akita, Aomori (Tsugaru zone and the northern part of the Shimokita Peninsula) Prefectures (chiefly on the Japan Sea side). *Saussurea sugimurae* occurs in Iwate and Aomori (Sanpachi zone) Prefectures (on the Pacific Ocean side).

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門田裕一：アジア産トウヒレン属（キク科）の分類学的研究 II. 青森県産の2新種

青森県六ヶ所村からムツトウヒレン *Saussurea hosoiana* Kadota を記載した。ムツトウヒレンは花期にも根生葉が生存することが最も著しい特徴で、しかも海岸に生えるために葉が革質で光沢があることも他の種から区別する良い特徴である。ムツトウヒレンの硬い葉質は北海道・夕張岳と日高山脈北部のチロロ岳高山帯の蛇紋岩地に生育するユキバヒゴタイ *S. chionophylla* Takeda を思わせる。根生葉が花期に生存し、花床に剛毛を有することなどの特徴からムツトウヒレンはモリヒゴタイ節 *Sect. Rosulascentes* (Kitam.) Lipsch. に所属することになる。この節は朝鮮北部に分布するが、その中では咸鏡北道と平安北道に分布するモリヒゴタイ *S. diamantiaca* Nakai がムツトウヒレンに最も近い。ムツトウヒレンはモリヒゴタイから次のような形質で区別される。①茎にははっきりした茎葉があり（花茎状 *scapose* とはならない）、翼がある。②茎はよく分枝して側生の花序を多数つける。③葉は革質で、厚く、光沢があり、広卵形、背軸面にクモ毛がない。モリヒゴタイを始めとしてオクヤマヒゴタイ、ウラジロヒゴタイなどモリヒゴタイ節の種は朝鮮北部に分布し、いずれもはっきりと花茎状になる。このため、ムツトウヒレンをこの節に入れることには疑問が残るが、現段階ではこのような処置としておきたい。ムツトウヒレンの属内での位置の確定は今後の課題である。

ムツトウヒレンは六ヶ所村物見崎の、太平洋に面したクロマツ疎林内に生育する。このクロマツ林は高さ5mほどで低木層を欠いていた。このため、海からの強風の影響をまともに受け、風衝地の環境に相当するものと思われる。本植物の頑丈な体のつくり、とくに植物体の割に太い茎や革質の根生葉の葉身はこの生育環境に適応したものと

みなすことができる。なお、大陸のモリヒゴタイ節の種は山地の植物で、葉質は日本産のトガヒゴタイやナンブトウヒレンのような洋紙質で、標高1000m以上の夏緑林内に生育する。

八戸市からはハチノヘトウヒレン *S. neichiana* Kadota を記載した。ハチノヘトウヒレンはナンブトウヒレン *S. sugimurae* Honda から次のような特徴で区別される。①総苞片は8列で、鋭角的に斜上するかあるいは圧着する。②総苞外片は長卵形で、先端は鋭形となり、尾状に長く伸長しない。③茎にはよく発達した翼があり、鋸歯縁となることがあり、④葉が革質となる。この他に、頭花の柄は短くかつ鋭角的に伸長する傾向がある。また、葉身は長卵形となるが、青森県産のナンブトウヒレンもそのような形になるので、この点では区別できない。

ハチノヘトウヒレンは八戸市の太平洋に面した海岸沿いの風衝草原に生育し、革質の葉もこのような環境への適応形態と考えられる。

なお、ナンブトウヒレンはこれまで総苞片が8列と記載されてきた（例えば Kitamura 1937, 北村1981）。しかし、タイプ標本を再検討した結果、6列であることを確認している。また、トガヒゴタイとナンブトウヒレンはこれまで混同されてきたり、あるいは同一視されることが普通であった。しかし、トガヒゴタイはクモ毛の多い総苞、開出する総苞片、卵形の茎葉をもつことで特徴付けられ、総苞にクモ毛が少なく、総苞片が斜上し、茎葉がやや矛形になるナンブトウヒレンと異なる。また両者は分布域にも違いがある。すなわち、トガヒゴタイは山形、秋田、青森（津軽地方、下北半島北部）の各県に分布し、日本海側に偏った分布を示す。これに対して、ナンブトウヒレンは青

森（三八地方）と岩手県に分布し，分布域は太平洋側に偏る．

東京大学大学院理学系研究科附属植物園教授
邑田 仁氏にはナンブトウヒレンのタイプ標本画像を送付していただきました．また，細井幸兵衛氏（青森市），根市益三氏（八戸市），嶋 祐三氏（つがる市），工藤安昭氏（深浦町），佐藤石夫氏

（深浦町），神 真波氏（青森県立郷土館）には現地調査の案内をしていただくとともに，国立科学博物館維管束植物標本庫（TNS）に標本並びに生態写真をご寄贈いただきました．ここに記して感謝の意を表します．

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